PSYCHOLOGICAL AND PHYSIOLOGICAL FACTORS IN NONCOMPLIANCE AMONG HEMODIALYSIS PATIENTS

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DEDICATED TO JOAN

with thanks for her clear perspective

and constant support

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Abstract

The relative contributions of psychological factors (especially anxiety and depression) and physiological factors (the renin-angiotensin system) to noncompliance among hemodialysis patients were measured, by correlating objective measures of each with indicators of noncompliance. A pilot study was performed, in which a battery of psychological questions was administered to four patients, from whom blood samples were also obtained for assay of plasma renin activity. It was found that the more compliant patients scored higher on scales measuring anxiety, and that PRA bore no apparent relationship to noncompliance.

This finding was confirmed in the expanded Main Study, in which twenty patients were interviewed, using questions selected from the pilot study. Again, those patients with higher anxiety scores were also generally rated as more compliant by dialysis staff. A very low correlation between depression and compliance was observed. Retrospective consideration of PRAs measured previously in a different set of patients showed an insignificant correlation between PRA and noncompliance.

It was concluded that anxiety, among the variables measured in this study, is the most important determinant of dialysis patients' compliance to fluid restriction, although depression may be important in blocking patients' appropriate response to a life-threatening situation. Intervention in these cases should therefore be directed towards the psychological aspects of noncompliance, as well as patient education, rather than measurement of physiologic changes, such as plasma renin determination.

Introduction

It is increasingly recognized that some types of behavior, traditionally considered within purely psychosocial parameters, are in fact determined to a large degree by hormonal or chemical abnormalities. As an example, various catecholamine and electrolyte imbalances have now been implicated in behavioral problems. Consequently, the treatment of these problems often requires investigation not only of the psychological factors involved, but also of possible physiological variations. In the present study, such a two-level approach is brought to bear on the problem of noncompliance to a medical regimen, specifically the restriction of water intake, among patients on long-term hemodialysis.

The consequences of excessive fluid intake with renal failure are potentially life-threatening, and a patient's failure to comply with fluid restriction raises several questions: Is the patient's understanding of the medical regimen limited by low intelligence or lack of education? Has the patient lost his ability or desire to comply appropriately, due to psychological factors, such as anxiety or depression? Or is the patient compelled to drink excessively by some strong physiological thirst mechanism? Noncompliance is most probably caused by a combination of many factors, and it is important to determine the extent to which these factors are involved. If psychosocial factors are dominant in causing patients' non-compliance then efforts to intervene, on the part of dialysis staff, should be directed towards correcting the patient's mental state or social situation. Even if the problem is narrowed down to a psychological one, a method must be devised to sort out the numerous variables, e.g. psychological defences,

anxiety, depression, availability of family support, etc.. and to quantify their respective contributions to noncompliance.

On the other hand, patients may fail to comply simply because of overwhelming thirst experienced between dialysis sessions. Thirst, as perceived by the brain, is affected by changes in serum osmolarity and fluid volume, both intracellular and extracellular. These changes work by pathways and receptors about which little is currently known. However, much work has recently centered around the renin-angiotensin system in particular, in connection with its possible role as a mediator of the thirst mechanism. This system is of interest in the present study of hemodialysis patients, because it may be an important factor in noncompliance to fluid restriction.

I. Involvement of Psychosocial Variables

Estimation of a patient's intelligence by the hospital staff has been used frequently in the past, as a criterion for the selection of patients, because of limited facilities available for chronic hemodialysis. Although dialysis is now available to almost all who require it, the relationship between intelligence and compliance remains an important one. Borkman, in a study of 661 patients (3), compared staff estimates of intelligence to staff ratings of compliance behavior, and found an insignificant-to-low relationship between them. Without objective measures of any variables, however, it can only be concluded that her data do not support the notion that patients must be intelligent in order to be compliant to a medical regimen. Studying 23 patients with a battery of tests to measure verbal ability, recall of verbal material, general intellectual capacity, spatial perceptual ability and visual retention, Hagberg (14) found that a higher intellectual level before the start of dialysis facilitated a more rapid adjustment to dialysis, but that after about 12 months on dialysis, the patient's intellectual level lost its predictive value.

The profound influence of emotions on the outcome of illness has been observed in many areas other than psychiatry; for example, it has been suggested (17) that in cardiac surgery, the patient's pre-operative emotional state influences morbidity and mortality, has predictive value, and therefore should be considered by the surgeon in assessing the patient as a surgical risk. If, as the authors contend, "psychological and physiological states are inseparable" in patients "passively" recuperating from cardiac surgery, then intuitively, psychological factors should play an even greater role in hemodialysis, where survival and compliance require a voluntary, active choice on the patient's part.

The psychological effects of long-term hemodialysis result from unusual stresses associated with the course of dialysis treatment (20, 21, 34). In addition to the stress associated with any chronic illness, the patient suffers from problems of physical limitation, dependence on the dialysis machine, complications arising during treatment, dietary restrictions, and anxiety resulting from the numerous procedures taking place in the dialysis unit. There is a very sharp distinction between the patient and the physically normal people around him, as well as between the patient's quality of life before and after dialysis began. Rehabilitation, in this instance, does not include a return to the previous lifestyle. In addition, patients face the possibility of imminent death, or at least progression of an already severe illness.

All of these stresses lead to certain psychological sequelae, the most common of which is depression. Loss of job and financial security, a decline in status within the family, frequently the occurrence of sexual dysfunction, and the accompanying feelings of guilt, frustration, isolation, sense of loss, can all contribute to aggravating the patient's depression. A study by Ziarnik et al. (49) of 47 patients showed that those who died within one year of initiating dialysis differed from those who had survived from three to ten years on dialysis, with regard to their scores on the Minnesota Multiphasic Personality Inventory (MMPI), administered at the onset of dialysis. Nonsurvivors were characterized by feelings of helplessness and by high levels of depression and anxiety, whereas survivors had a mild level of depression and were generally optimistic about the future.

Predictably, patients' depression sometimes manifests itself in suicidal behavior. The severity of stresses faced by patients on dialysis ultimately is evidenced by the much higher rate of suicide in this group,

as compared to the national suicide rate (20). In light of this finding, patients' overindulgence in food and fluid intake may, in some cases, be interpreted as a gesture of slow suicide, less overt than other means (2).

Psychological studies of patients on dialysis (21) have shown that a majority of patients enter a period of confidence and hope initially, which occurs from one to three weeks after the first dialysis session. After a pre-dialysis period of anxiety and a general feeling of poor health, fatigue and other signs of the slow downhill course of renal failure, they begin a life-saving treatment which may at first rapidly improve their sense of well-being. During this period, patients readily accept their dependent roles, despite intense initial anxiety over their new situation. Typically, patients then undergo a period of disappointment and discouragement. This is complicated by a conflict between the desire to remain dependent on a life-saving procedure, and a desire to meet the expectations of others, as perceived by the patients, that they should "succeed" in regaining their previous independence. Over the long term patients may gradually reach an understanding of the limitations of hemodialysis and of their own freedom. However, they still generally rate their quality of life as fair-to-poor, and suffer from a decrease in self-esteem, associated with feelings of helplessness.

Successful adaptation to long-term hemodialysis requires the constant use of psychological defenses and other means of coping. A substantial portion of patients entering hemodialysis programs suffer from psychiatric symptoms antedating the onset of uremia (25), and therefore have less likelihood of being able to deal with the additional stresses of chronic renal disease. A study at the Mayo Clinic (26) which employed the MMPI found that patients with unsatisfactory adaptation had elevated mean scores

on the hypochondriasis, depression, hysteria, psychasthenia and schizophrenia scales. While a particular personality type associated with a positive prognosis could not be defined, it was demonstrated that severe emotional conflict deleteriously affects patients' ability to participate successfully in long-term hemodialysis. Hagberg and Malmquist (14, 15) found among 23 patients that a smaller number of social contacts, a stronger reaction to the kidney disease, and a more "inflexible structure of defence, employing isolation only" are indicators of a poorer prognosis.

A related predisposition towards difficulty in adapting exists among adolescent patients (4, 28), who have been found to comply less well than adults, and to have lower vocational rehabilitation and more restricted social activities. Areas in which adolescents already experience problems are amplified by the additional stress of hemodialysis: changes in their physical appearance, decline in bodily function, conflicts over physical and emotional dependency, aggressive behavior, and separation from the peer group. Perhaps even more importantly, separation from the family challenges and strains already ambivalent family relationships. The impact of chronic illness on an adolescent is markedly different from an adult, and often aspects of that difference, such as a greater tendency to regress, a low tolerance of frustration, the acting out of independence needs, and the need to deny being different from the peer group, combine to result in failure to comply with a medical regimen.

Attempts have been made to quantify various dimensions of illness behavior in long-term dialysis (29, 30, 31); the meaning of an illness to the individual, and his response to it, can be broken down into several measurable variables by a "Response to Illness" questionnaire. These variables include: surrender vs. fight; distressing preoccupation; paranoid

hostility to illness as an enemy; helpless dependence; paranoid non-involvement vs. optimistic involvement; openness vs. concealment; and lack of information about the illness. Clearly, the variables which might be considered in a study of this sort are numerous, due to the almost infinite number of ways in which individual patients might react to the same situation.

Other studies look at illness behavior in terms of the psychological defences employed by the patient under stress (13, 14, 20, 23). The most frequently used defence mechanism during long-term adaptation to dialysis appears to be denial, which plays a key role in reducing the patient's anxiety arising from the course of renal disease, in reducing depression related to helplessness, and also in preserving the patient's sense of well-being. Denial may, however, appear in the form of noncompliance, in a strongly independent patient who denies dependency on the entire dialysis procedure. The patient sometimes refutes his dependency by missing scheduled dialysis sessions, but more often his uncooperativeness includes a failure to follow dietary and fluid restrictions. The frequency with which denial is used varies from group to group; Greenberg et al. (12) found, instead of denial, a "general resignation and acceptance of the dialysis procedure as a means of survival," possibly because of the ethnic and religious makeup of the group studied.

The unconscious counterpart of denial, repression, is also frequently used under the stress of dialysis. As time spent on dialysis progresses, the MMPI shows an elevation in the index measuring repression, and a corresponding decline in anxiety level (40). There is an inverse relationship as well, between repression and depression. Other, less important,

defence mechanisms often appearing in the setting of dialysis include displacement, isolation, projection and reaction formation, all of which may or may not contribute to patients' successful adjustment, depending on the particular situation. On the other hand, regressive tendencies and emotional defences involving physical manifestations, such as hysteria or hypochondriasis, are agreed to have a negative effect on adaptation to hemodialysis.

Fantasy serves as another important adaptive function, within limits beyond which it becomes counterproductive and conducive to self-defeating behavior by the patient. In a study of 35 subjects and their spouses (23), patients as a group were found to have a lower self-esteem (especially female patients) than spouses, and also to indulge in fantasies to a much larger extent. Fantasies involving self-esteem, fear of failure, and guilt were particularly common. Greater frequency of fantasy behavior in female patients, but not in males, was shown to reflect poor adjustment to dialysis. The fact that the difference in self-esteem between male patients and their wives was almost insignificant may indicate that the wives served as "resources of self-esteem" for their husbands.

The importance of family members in providing an emotional support system is clear, since many of the patient's problems, e.g. guilt feelings and conflicts concerning dependency, may stem from the suddenly and drastically altered role he plays within the family. Among survivors and non-survivors on a dialysis unit, a greater percentage, 86%, of the non-survivors' parents were deceased, compared to 50% for the survivors (13). Nevertheless, the percentage of deceased parents among survivors was high; family support may have come from other family members, resulting in a better prognosis. Despite some disruption in the nuclear family of many patients, most reported live

siblings or children. Additional support can derive from ethnic or religious groups as well.

It has been seen that successful adaptation to chronic hemodialysis involves various internal and external sources of support. Shanan et al. (38) observed a reduction in the tendency to cope actively with threatening situations, among patients experiencing prolonged stress, with consequent impairment of their sources of support, and maladjustment to treatment. Patients with chronic renal failure had low interest in "constructive interpersonal relationships and in goal-directed, socially approved activities." They also showed greater passivity, a negative self-perception, and an exaggerated concern with their own problems. While these findings deal with patients just beginning hemodialysis (having undergone prolonged stress since the diagnosis of renal disease), they can easily be applied to patients at a later stage of their disease. Enduring dialysis for many years brings many patients eventually to a point of "exhaustion," where they lose the ability to cope actively with illness.

In summary, patients who fail to adapt to treatment, who are unable to handle the numerous stresses imposed on them by hemodialysis, may be divided into several groups. Some patients enter treatment with pre-existing ego weakness, emotional conflicts, or loss of the ability to cope, due to prolonged stress. After dialysis has begun, another group of patients develop feelings of depression and anxiety, and fail to use psychological defences appropriately to cope with stress. Some patients may have strong defence mechanisms which actually interfere with adaptation. A third group includes those patients who begin dialysis with strong defences, but after a long period of treatment, perhaps years, lose the desire or ability to

cope actively. Some patients who feel that their fates are determined largely by external forces and events, rather than their own active decisions, may fall into this group. Finally, some patients lack the family or social support necessary for successful adjustment. There are, of course, many cases in which these groups overlap, and the patient who belongs to one or more categories may be presumed to be at some risk for noncompliance.

As stated in the Introduction, the psychological factors which characterize each of these groups may be only partly responsible for noncompliant behavior. A physiological thirst mechanism, specifically the renin-angiotensin system, may also play an important role in hemodialysis.

II. Involvement of the Renin-Angiotensin System

The biochemical stages of the renin-angiotensin system have been elucidated through numerous studies since the conception of the Goldblatt kidney in 1934, when the existence of a hypertension-related humoral substance, released by the kidney, was first demonstrated. Subsequent studies have been concerned largely with the pressor effect of angiotensin, its role in hypertension, and its stimulation of aldosterone secretion by the adrenal cortex. However, in the present investigation of noncompliance, the relevance of the renin-angiotensin system lies in its possible function as a physiological thirst mechanism.

Overall, the purpose of the renin-angiotensin system seems to be the preservation of the body's fluid (volume and pressure) status. Acute depletion of intravascular volume, followed by reduced blood flow to the kidneys, results in production of the enzyme renin by the kidney's juxtaglomerular cells (42). Renin then acts on its substrate, a liver-produced glycoprotein contained in the plasma alpha-2-globulin fraction.

The product of this proteolytic reaction is angiotensin I, a decapeptide without significant pressor activity, which in turn undergoes a cleavage reaction with angiotensin converting enzyme, to form the active octapeptide angiotensin II. The latter reaction takes place primarily in the lung, although angiotensin converting enzyme is also present in plasma and other tissues.

Angiotensin II (AII) is the most powerful direct pressor substance known, about fifty times as potent as norepinephrine. In addition, it is responsible for the release of aldosterone by the adrenal cortex, an effect which might be mediated by the desaspartyl form of AII, a possible AIII. By this means, the renin-angiotensin system further contributes to the preservation of fluid status, as aldosterone stimulates the reabsorption of sodium, and the accompanying water, by the distal tubule of the nephron.

Aside from its response to volume changes, the renin-angiotensin system is affected by acute sodium depletion. Drueke et al. (5), in a study of 28 patients on hemodialysis, used a model of artificial kidney with a closed-circuit dialysis system which enabled them to change sodium and potassium balance without changing volume. They found a significant correlation between sodium depletion and increased plasma renin activity (PRA); potassium depletion also resulted in increased PRA, but of a lower significance level. The macula densa has been implicated in the kidney's response to sodium depletion, but the precise mechanism by which PRA increases is unclear. In any case, acute changes in sodium balance in vivo are accompanied by shifts in fluid between intracellular and extracellular compartments, so that PRA is probably determined by a combination of factors.

Plasma renin concentration increases following a decrease in blood

volume by dialysis, in a majority of patients. In a study concerned with hypertension among hemodialysis patients, Schalekamp et al. (35) measured plasma renin concentrations as high as 300 ng/ml/hr in hypertensive patients, compared to a range from 2.1 to 45 ng/ml/hr in normotensives, following dialysis. High PRA in hemodialysis patients may also involve changes in sodium balance due to diet restriction, as well as the aberrant state of the sensory and renin-secreting apparatus in a diseased kidney. Even in anephric patients, PRA may still be normal, because of secretion of renin at extrarenal sites: these sources are unknown as yet, but possibilities include the adrenal glands, arteries, liver, spleen and the pregnant uterus (48).

Variations of PRA in hemodialysis patients have been associated with certain physical manifestations, beyond the maintenance of normal fluid status. For example, patients who complained of headache during dialysis were found to have low plasma renin levels, whereas patients without headache had normal or high renin levels (1). It is speculated that dialysis headache may be secondary to changes in blood volume, vasodilatation, and prostaglandin secretion. Elevated PRA, on the other hand, is associated mostly with hypertension. Weidmann et al. (47) divided 51 patients into three groups: those with normotension, those with controllable hypertension (blood pressure decreased by dietary restrictions and removal of excess sodium and fluid during dialysis), and those with uncontrollable hypertension. In the first two groups, patients had low-to-normal renin levels, whereas the third group was characterized by moderately to markedly increased PRA, and hypertension in these patients was alleviated by bilateral nephrectomy. Sheth et al. (39) reported the case of a hypertensive infant who had a Wilms tumor of the

kidney with high renin activity. Removal of the tumor relieved the hypertension; interestingly, the patient also had unusual thirst prior to surgery, which disappeard thereafter. The pathogenetic role of renin in hypertension remains a highly controversial topic, but it can be seen that renin is at least involved in various conditions, mainly through its secondary effects.

Equally controversial is the role played by the renin-angiotensin system in causing thirst and drinking (6, 10). Hypovolemia, ligation of the inferior vena cava, or the use of beta-adrenergic drugs causes animals to drink in response to an extracellular fluid deficit. Fitzsimons (7) found that this response was diminished in nephrectomized animals. Drinking in response to partial constriction of the renal arteries was likewise diminished in nephrectomized rats (8). Support for the existence of a renal factor involved in the drinking response came from the observation that saline extracts of renal cortex, when administered to rats, induced drinking. These studies led to similar findings with systemically administered renin and AII; the effects were subsequently found to be mediated by the latter.

AII is now known to be a potent dipsogen in all species of animals tested. Trippodo et al. (46) infused dogs with AII for ten days and found that prolonged systemic infusion of AII resulted in a greater than two-fold increase in drinking, which lasted for several days. Hsiao et al. (16) supported the idea that AII may participate in normal hypovolemia-induced drinking. Increased drinking was observed in rats given a "physiologically reasonable" dose (25 ng/min/kg) of AII, and doses as low as 4 ng/min/kg sufficed to induce drinking in rats with concurrent cellular dehydration. In addition, this drinking was blocked by a competitive inhibitor of AII.

Other studies have dealt with the injection of AII into the brain, as well as the periphery, and there are numerous reports of increased drinking as a result (33, 37). Furthermore, the drinking behavior is specific, and is the same as spontaneous drinking. That a hormone whose purpose seems to be the maintenance of extracellular fluid homeostasis may be partly responsible for the regulation of thirst and drinking, is an attractive idea.

Controversy arises over the extent to which AII controls normal, spontaneous thirst. Stricker (44, 45) studied plasma renin activity under several hypovolemic or simulated-hypovolemic conditions, and found that AII contributes "less than 30% of the stimulus" for water intake. Other stimuli, such as vascular baroreceptors, may be more important in regulating thirst. Lehr et al. (19) stimulated thirst in rats by caval ligation or beta-adrenergic drugs, and failed to diminish the thirst by blocking conversion of AI to AII with SQ20,881, a converting enzyme antagonist. Their conclusion was that bilateral nephrectomy was effective in obviating thirst because of the essential nature of some other renal mechanism, as yet undefined. On the other hand, Malvin et al. (22) successfully attenuated the physiological response (increase in drinking) to water deprivation by infusing P-113, an AII blocking agent, prior to allowing water-deprived animals to drink.

The question is complicated by the division of spontaneous drinking into several distinct types of behavior in animals; the fact that there is a renin-angiotensin system endogenous to the brain, apart from the renal system, which contains a renin-like enzyme, renin substrate, angiotensin, and angiotensin converting enzyme (12); confusion over the various models of hypovolemic thirst, e.g., a renal-dependent model using isoproterenol, a

renal-independent model using polyethylene glycol, and a partially renal-dependent model involving caval ligation). It is apparent that multiple factors, not only AII, play a role in the stimulus to drink. For example, isoproterenol is a potent dipsogen which stimulates renal renin secretion. Ramsay (32) showed that low-dose isoproterenol induces thirst by increasing the activity of the renin-angiotensin system, but that at higher doses there is no proportionate rise in PRA. The dipsogenic effect of isoproterenol at higher doses is renin-independent, possibly involving changes in blood pressure, or perhaps even receptors sensitive to isoproterenol itself.

Further controversy surrounds the mechanism of AII action on the central nervous system (11). Because intracranially administered AII is more highly dipsogenic than intravenous AII, a central site of action is likely. The exact sites at which AII exerts its effect are unclear at present, but many studies have begun to outline the hormonal pathway. AII crosses the blood-brain barrier slowly, so that studies have concentrated on regions of decreased or absent barrier, namely the circumventricular organs. Among these, AII has been found to be active at the rostral diencephalon, the optic recess of the third ventricle, and the subfornical organ (SFO). The latter, in particular, has been shown to possess dipsogenic AII receptors (41), through elimination of the dipsogenic effect by selective destruction of the SFO, or by administration of saralasin at that site. In addition, drinking is produced by injection, at the SFO, of AII in doses compatible with maximal levels of peripherally circulating AII.

The manner in which peripheral AII interacts with the central renin-angiotensin system is unknown, but it is clear that the dipsogenic effect is directly mediated by AII in the central nervous system (9, 33). The

hormone may reach a dipsogenic receptor by the bloodstream, by local synthesis in the brain, or by a combination of the two. Within the brain, transport of AII may be accomplished by neurons, cerebrospinal fluid, vascular routes (36), or thirst may ultimately be mediated by a neurotransmitter, e.g. a central cholinergic or alpha-adrenergic agent. A proposed central neural pathway for the effect of AII (18, 24) focuses on the preoptic region as a receptor site, extends along the medial forebrain bundle to the midlateral hypothalamus, and ends in "an area ventrolateral to the central gray." Pathways of this type are worked out mainly by specific lesion experiments; much remains to be done, and the mechanism of AII-induced thirst, beyond the initial brain receptor, is poorly understood.

Whatever the precise mechanism may be, evidence for a connection between the renin-angiotensin system and thirst is strong. Plasma renin concentrations have been measured, following dialysis, which equal or exceed levels created experimentally by intravenous infusion. Such high levels of AII, in turn, have been shown repeatedly to result in increased thirst and drinking. While it must be conceded that the issue of AII's role in the regulation of normal, spontaneous thirst is still highly controversial, the involvement of AII in hemodialysis-associated thirst is a separate issue altogether. Under the extraordinary, non-physiological circumstances of dialysis, including rapid changes in electrolyte and volume states, patients undergo artificially induced stimulation to the renin-angiotensin system. In this way, they more closely resemble the experimental models of hypovolemia than the physiologic model around which much of the controversy revolves. If AII causes excessive drinking in these patients, efforts at intervention should include the use of AII antagonists and converting enzyme blockers, as well as nephrectomy.

In this study, we hypothesize that AII-induced drinking may be an alternative explanation for noncompliance. The correlation between post-

dialysis PRA, or AII levels, and noncompliance is of interest because of the possible predictive value of PRA (however, lack of correlation would not rule out involvement of the renin-angiotensin system in thirst). Thus, non-compliance may be a function of either a) increased PRA, leading to thirst, b) psychosocial factors, or c) an interaction of the above. It is the purpose of the present study to determine whether these psychological and physiological factors play a role in the group of dialysis patients studied.

PILOT STUDY

At the outset, a pilot study was performed to examine, on a rough level, the influence of the renin-angiotensin system and psychological factors on noncompliance. This initial study would illuminate potential problems with the overall project, and also indicate which portions of the project should receive particular emphasis.

Subjects and Methods

The pilot study included four patients from the Hemodialysis Unit of Yale-New Haven Hospital. Written informed consent was obtained from each patient, and the Human Investigation Committee of Yale University approved the protocol. Two of the patients, selected from a complete range of compliant-to noncompliant patients, were the most compliant in the unit, and the other two were the least compliant, as determined by an informal survey of the hemodialysis staff. Through past experience with patients in the unit, staff assessment of compliance was acknowledged to be a reasonably reliable measure, even compared to objective methods such as measuring blood pressure and weight changes. It was hoped that any potential association between compliance and the variables being tested, would be

brought out by picking patients from either extreme of the compliance range. Although the patient sample size was too small for any rigorous statistical analysis, initial impressions would still be helpful.

Because exercise, and even abrupt changes of posture, can elevate plasma renin levels acutely, the patients were instructed to come to the unit 45 minutes before dialysis to assume a semi-supine position. At the beginning of dialysis, blood was drawn for the pre-dialysis renin level, and after five hours, another sample was drawn for the post-dialysis renin level. The blood sample was mixed with 1.5 mg/ml of disodium EDTA and cooled to 0°C. Determination of plasma renin activity (PRA) in these samples was performed by Dr. Robert H. Noth, at the West Haven V.A. Hospital, by radioimmunoassay of angiotensin I (27).

The patients were interviewed separately, each during one dialysis session, in order to obtain demographic and psychological data. The complete questionnaire, included in the Appendix, was composed of six sections: 1) an outpatient questionnaire, which evaluated the patient's understanding of his illness, therapy procedures, and dietary restrictions; 2) a visual analog scale, scored from 0, "not thirsty at all," to 100, "most thirsty I've ever been," for the patient's self-evaluation of thirst over the week prior to that dialysis session; 3) the State-Trait Anxiety Inventory (STAI) of Spielberger, which measured the patient's anxiety level at that moment (State) and in general (Trait); 4) the Beck Depression Inventory (BDI); 5) the Zung Depression Inventory (ZDI); and 6) a Social Reaction questionnaire devised by Rotter, which measured the degree to which pationets felt their fates were determined by external forces and events ("external locus of control").

Results and Discussion of the Pilot Study

Plasma renin activities of the four patients, as reflected by assay of angiotensin I (ng/ml/hr), are recorded in Table 1. Of the two compliant patients, subject A had an increase in PRA from 3.8 to 5.1 during dialysis, and B rose from 2.0 to 2.3. Of the two noncompliant patients, C showed a drop in PRA from 5.1 to 2.3, while D increased only from 1.3 to 1.6. Average PRA in the general population is in the area of 1.0 ng/ml/hr, so the PRAs of this group are somewhat elevated. However, PRA in the compliant patients, A and B, rose at least as much as in patient D, and PRA actually fell in patient C, so that these data do not support the contention that noncompliant patients drink excessive amounts of water at home because of high post-dialysis PRA. It might be speculated that patient D was noncompliant mainly on the basis of AII-induced thirst, while patient C failed to comply for other reasons, perhaps psychological in nature. In that case, however, it would be difficult to explain the compliant behavior of patients A and B, who would have experienced the same amount of thirst. Factors other than the renin-angiotensin system must be involved in differentiating compliant from noncompliant patients.

The results of the questionnaire are shown in Table 2. On the visual analog scale, there was no significant difference in the patients' rating of their own thirst over the past week. Demographic data for all four patients were comparable, with minor differences. Both noncompliant patients were black, Baptist, and had tenth and eleventh grade educations. One of the compliant patients was Catholic; both were white and had completed at least a high school education. Otherwise, the patients were similar in age, and all had some combination of spouses, parents, children and friends- in other words, positive social support.

Table 1. Pilot Study- changes in PRA during dialysis.

Subject	Pre-dialysis PRA (ng/ml/hr)	Post-dialysis PRA (ng/ml/hr)
A	3.8	5.1
B	2.0	2.3
C	5.1	2.3
D	1.3	1.6

Table 2. Pilot Study- questionnaire results.

Subject	Knowledge of Illness (out of 8)	Visual Analog Scale of Thirst (%)	STAI (S/T)	BDI *	ZDI **	Social Reaction ***
A	8	20	33/35	5	33	14
B	8	0-5	26/31	10	41	9
C	6	15	20/23	2	39	11
D	7	20	21/24	3	26	15

*Maximum score on BDI= 57

**Maximum score on ZDI= 80

***Maximum score on Social Reaction= 23

The questions testing patients' understanding of their illness showed a greater knowledge on the part of compliant patients, who understood the seriousness of their condition and the nature of their treatment. In contrast, the noncompliant patients both felt that they were only "slightly ill,"although they knew the purpose of hemodialysis. This difference in attitude may have been the reason for a difference in scores on the STAI: the compliant patients scored significantly higher than noncompliant patients, on both the State and Trait anxiety sections. With a maximum score of 80 (highest anxiety) on both scales, a difference of 13 on the State scale and 12 on the Trait scale, between patients A and C, is interesting. Whether they were more compliant because of higher anxiety about their illness is a matter for conjecture at present, but it is intuitively appealing that a carefree attitude toward illness would result in less active effort to treat it, on the patient's part.

Both the Beck and Zung scales for depression showed mixed results, with slightly higher depression scores among the compliant patients, taken together. However, such a small difference in scores is of questionable significance. With a maximum score of 57 on the Beck Depression Inventory and a threshold score of 21 indicating moderate-to-severe depression, all four of the patients fell easily within the non-depressed range. The Zung scale produced similar results (maximum 80, minimum 20), and may be superfluous when the BDI is being administered simultaneously.

The Social Reaction Inventory showed a slightly higher tendency toward an external locus-of-control among the noncompliant patients, but once again, the significance of such a slight difference was questionable. Whether a patient complies with dietary restrictions did not seem to be related to the degree to which he feels in control of his own future, at least as

measured by the Rotter scale in this small number of patients. Further research on this question should be pursued, but because of the need to shorten the questionnaire which emerged during the pilot study, we decided to leave the question for some future studies. Overall, the factors most impressively involved in compliance were anxiety level, and the patient's knowledge about his disease. Depression was also interesting, despite somewhat equivocal results, and was carried over to the main study to determine its importance in a larger group of patients.

MAIN STUDY

Based on the results of the pilot study, certain adjustments were made in the main project. PRA was seen to have no clear relationship to noncompliance in that group of subjects; furthermore, logistical problems arose which prevented the assaying of a large number of blood samples for plasma renin activities. It was decided, consequently, to shift emphasis to the psychological aspects of this investigation, and to consider the influence of the renin-angiotensin system on noncompliance in a more informal manner.

Subjects and Methods

Permission was obtained from Dr. Robert Noth to use an unpublished set of data on 16 patients from the same dialysis unit, including weight gains between dialyses and post-dialysis PRAs. Although the data had been gathered earlier for a study of hypertension, we decided to look at them retrospectively in connection with noncompliance. The data are shown in Table 3.

Table 3. Noth data.

Subject	Weight Change (lb)	Post-dialysis Renin (ng/ml/hr)
A	4.5	0.9
B	3.0	5.0
C	3.5	15.2
D	2.25	27.7
E	1.5	6.3
F	6.75	31.7
G	6.0	0.9
H	7.5	16.9
I	6.0	8.5
J	2.25	5.8
K	4.0	26.7
L	6.5	9.3
M	4.75	15.7
N	4.5	6.2
O	2.25	1.1
P	5.0	4.2

Our assumption was that weight gains between dialysis sessions were due primarily to fluid intake, and that the patients with the highest weight gains were therefore the most noncompliant. There are, of course, problems with this assumption, and weight gain will be considered a crude indicator of noncompliance, at best.

The psychological questionnaire was trimmed as a result of the pilot study, and administered to twenty randomly-selected patients at the dialysis unit of Yale-New Haven Hospital. Once again, informed consent was obtained from the patients, and the new protocol was approved by the Human Investigation Committee. The altered questionnaire consisted of three sections: 1) outpatient questions to gather demographic data and evaluate patients' understanding of their illness; 2) the State-Trait Anxiety Inventory (STAI); and 3) the Beck Depression Inventory (BDI). The Zung Depression Inventory was felt to be non-contributory, and unremarkable or equivocal results in the pilot study led to the omission of the Visual Analog Scale for thirst, as well as the Social Reaction questionnaire.

Once again, estimation of patients' compliance was reached by staff assessment, but in this portion, the assessment was more formalized. Two staff physicians and the unit head nurse were asked independently to rate each of the twenty patients with regard to compliance to fluid restriction, on a scale from 1 to 100. The separate ratings would be compared for reliability, and the widely divergent ratings would then be discarded, or would at least diminish the certainty of our eventual findings. In correlating each of the psychological variables with patients' compliance, an average of the three staff ratings was used. Statistical analysis of

the staff assessments revealed a correlation coefficient of .991 to .995 (p less than .001) between each of the ratings and the average value. As a result of this extremely high agreement, none of the ratings were discarded.

Results of the Main Study

Investigation of renin and noncompliance was limited to statistical analysis of the data in Table 3, to determine the correlation between weight gain and post-dialysis PRA. Using a t-test of regression coefficients, a correlation coefficient of .0319 was derived, indicating a very low correlation between these two sets of data.

Correlations were also sought between each of ten variables (Table 5): sex of subject, age, education, marital status, size of family, knowledge of disease, State anxiety, Trait anxiety, Beck depression score, and the average compliance rating. The results of the knowledge-of-illness questions, the STAI, BDI, and average compliance ratings are shown in Table 4. Positive findings were as follows: correlation coefficient between Trait anxiety and compliance was .682 (p less than .001); between State anxiety and compliance, .544 (p less than .05); between State and Trait anxiety, .601 (p less than .01); between Beck depression and Trait anxiety, .545 (p less than .05); between knowledge of disease and Beck depression, .445 (p less than .05); and finally, between education level and knowledge of disease, .747 (p less than .001). Notable negative findings include the following: correlation coefficient between Beck depression and compliance, .052; between knowledge of disease and compliance, .206; between knowledge and Trait anxiety, .213; between family size and compliance, .041. Two variables whose correlations with compliance did not fall within strict confidence limits, but which were still remarkable, were increasing age and positive marital status (coefficients of .339 and .328, respectively).

Table 4. Questionnaire results.

Subject	Knowledge (out of 8)	STAI State/Trait	BDI	Compliance (%)
A	7	27/28	4	48
B	7	27/30	0	95
C	5	40/52	11	93
D	6	21/53	21	73
E	8	49/58	23	90
F	8	29/39	2	52
G	5	38/32	4	87
H	7	25/22	9	12
I	8	41/37	2	62
J	8	59/44	6	78
K	7	32/41	3	98
L	8	25/27	4	42
M	8	37/42	2	88
N	8	21/23	2	47
O	8	41/38	6	80
P	7	42/50	6	78
Q	8	27/25	6	38
R	8	26/26	0	62
S	8	26/25	8	47
T	4	31/36	20	55

Table 5. Correlation coefficients (Pearson r) between anxiety, depression, knowledge of disease, compliance rating, and other variables.

	Trait Anxiety	Depression	Knowledge	Compliance
Sex of Subject	-.025	-.144	-.366	.069
Age of Subject	-.041	-.378	-.113	.339
Education	-.160	-.329	.747***	-.209
Marital Status (married)	.327	-.022	.366	.328
Family Size	-.118	-.188	.149	.041
Knowledge	-.213	-.445*	1.000	.206
State Anxiety	.601**	.129	.049	.544*
Trait Anxiety	1.000	.545*	-.213	.682***
Depression	.545*	1.000	-.445*	.062

* p less than .05

** p less than .01

*** p less than .001

Discussion

It should first be noted that the results obtained from this group of patients may not hold true for other dialysis units. Different studies have gathered varied data with respect to changes in plasma renin activity during dialysis, the incidence of anxiety and depression, makeup of the patient population, and so on. Furthermore, staff ratings of compliance may differ widely in reliability from one unit to another. With this initial caveat in mind, we can view the results of the present study as they pertain to this particular dialysis unit, with possible application to patients elsewhere.

The insignificant correlation, indicated in the pilot and confirmed in the main study, between post-dialysis PRA and noncompliance, was disappointing in that we had hoped to demonstrate the importance of a physiological thirst mechanism in causing noncompliant patients to drink excessively. However, it is important to realize that this finding does not bear on the question of whether AII plays a role in the regulation of physiologic thirst. Nor does it mean that the renin-angiotensin system does not have a small thirst-producing effect in dialysis patients, an effect often masked by overriding psychological factors. Finally, the possibility remains that a few patients have mainly AII-induced noncompliance, without the involvement of psychological factors. If so, these patients would be so few in proportion to all noncompliant patients that the usefulness of screening renin determinations would be extremely limited.

More work clearly needs to be done in the area of renin and hemodialysis. This study has dealt with renin-angiotensin only informally. Furthermore, because of difficulty in obtaining PRA measurements for the main study, methodological problems arose over the necessity of studying data retro-

spectively. For example, the correlation between PRA and weight gain was ultimately compared to the correlation between psychosocial variables and staff assessment of compliance. The exact relationship between these subjective and objective indicators of compliance is unknown, and ideally PRAs should have been measured at the same time in patients to whom the questionnaire was administered.

Nevertheless, these results provide the opportunity to make a rough comparison and to discuss the dynamics of noncompliance in general terms, with the understanding that further research will clarify our initial impressions. The low PRA/noncompliance correlation is contrasted with a highly significant correlation between anxiety and compliance. This finding confirms that of the pilot study, in which the compliant patients scored higher on the STAI. The fact that both State and Trait anxiety are involved is not surprising, since the data show that many patients who were nervous at the time of the interview were also anxious in general. No other variable was correlated with compliance to the extent of Trait anxiety.

It is difficult to define causal relationships between the variables considered here, but explanations can be proposed which encompass some, if not all, of these findings. Trait anxiety is associated with depression, which in turn is associated with knowledge of disease; it might be speculated that knowledge about dietary restrictions, the reasons for them, and the consequences of noncompliance, causes some patients to be compliant, although it has the added effect of making them depressed and anxious. However, in that case, the low correlations between knowledge and anxiety, and between knowledge/depression and compliance, are puzzling.

More in accord with the observed data is the explanation that some patients are anxious, independently of their knowledge of disease (hence the low correlation), and these patients make a greater effort to follow dietary restrictions, primarily out of a desire to lessen their anxiety. Such an explanation is intuitively attractive. The causes of anxiety may be numerous; for example, there was a correlation coefficient of .327 between anxiety and positive marital status. The correlation is not high, but it may still reflect a contribution of marriage and its attendant responsibilities to patients' anxiety, under the severely restrictive conditions of hemodialysis. Other causes of anxiety, not included among the variables in this study, may also play a role.

The variables other than anxiety must then be considered separately. Again, the relatively low correlation between knowledge and compliance is a mystery, since one would expect patients who knew the consequences of excessive fluid intake to limit their drinking more readily. Depression may be the intervening factor, which blocks the appropriate behavior. In order for depression to interfere with the benefits of increasing knowledge to such a large extent, it must be present in a substantial number of knowledgeable patients, and this requirement is met by the high correlation between knowledge and depression observed here. Ironically, it remains possible (in fact, probable) that knowledge of the disease and its life-altering nature has a direct role in causing depression in these patients.

Despite his knowledge of the consequences, the depressed patient is noncompliant because of a breakdown in appropriate responses and indeed, a possible tendency toward suicide in some cases. No direct link is demonstrated in this study between depression and noncompliance, but the very

low correlation found between depression and compliance is consistent with such a link. If not for the effects of depression, then, knowledge of disease may have a greater association with compliance than is reflected by a coefficient of .206 (which is still relatively significant, however, compared to a coefficient of .41 for size of family).

The final unexplained connection is that observed between depression and anxiety. The high correlation probably reflects a large overlap between patients with depression and those with anxiety, rather than some causal relationship between the two variables. In patients with both anxiety and depression, the factors may be seen to counter each other partially, in some ways, with respect to compliance. This rather simplified scheme is consistent with the low observed correlation between anxiety and knowledge of disease, which might be expected to raise anxiety in most patients. As in the case of correlating knowledge and compliance, depression may be identified as an intervening factor, blocking the anxiety which is expected to result from the knowledge that renal failure is a life-threatening illness, and that compliance to the medical regimen is essential to preserving life.

Anxiety is desirable only as far as it encourages the patient to be compliant. A healthy concern over the consequences of noncompliance should be distinguished from an extreme, counterproductive anxiety, just as other psychological factors, such as the use of denial, may be either beneficial or detrimental to the patient's outcome. Because of its high correlation with compliance, "healthy" anxiety may be important with regard to staff intervention in noncompliant cases. The findings of this study suggest the possibility that increasing patient awareness of the dangers of noncom-

pliance will result in a greater "healthy" anxiety and greater compliance in turn, but only if the effects of depression are first alleviated.

The latter can be accomplished through traditional means, such as psychiatric therapy or antidepressant medications in extreme cases. Alternatively, changes in the staff approach to depressed patients, or in family functioning (43), may provide the needed additional emotional support. The patient's perceived loss of status within the family, for example, is important in aggravating depression. At the same time, staff perception of the patient as "uncooperative," or otherwise problematical, may adversely affect the way staff members treat the patient or communicate with him, resulting in a self-fulfilling prophecy of noncompliance. Increased hospital staff and family education as to the psychological forces commonly at work among hemodialysis patients, with emphasis on learning to recognize and appreciate the unusual stresses brought on by their type of chronic illness, may be helpful in ultimately avoiding or decreasing depression. These changes should be effected in conjunction with increased patient education regarding dialysis; no patient with renal failure should believe that he is only "slightly ill," for instance. As stated previously, raising the level of patients' knowledge of their illness should lead to greater compliance overall, in patients who are free of psychological factors which may interfere with the appropriate rise in "healthy" anxiety.

The topic covered in the present study is obviously a complicated one, about which few conclusions can be drawn. Noncompliance is a complex phenomenon with countless different factors contributing to the final outcome. Despite the lack of evidence to support the involvement of the

renin-angiotensin system, a physiological thirst mechanism may yet play a role in causing some patients to be noncompliant. Psychological factors, on the other hand, have repeatedly been shown to affect patients' adjustment to long-term hemodialysis, and that effect is clearly evident in this study. With regard to intervention in cases of noncompliance, then, attention should be directed to the psychological determinants of patients' behavior. Further work clearly needs to be done, in order to elucidate the role of physiological factors, to identify a larger number of psychosocial variables which may be involved in noncompliance, to devise questionnaires which are more sensitive to those variables, and to determine the relative importance of the numerous factors in individual patients. In this manner, it may eventually be possible to predict the outcome of individual cases, and therefore to direct therapy appropriately.

Summary of Findings

The main study was divided into two parts: 1) a retrospective analysis of data concerning PRAs and noncompliance, and 2) administration of a psychological questionnaire to patients rated for compliance. The most notable findings were as follows:

a) There was a low correlation (.0319) between PRAs and noncompliance.

b) Both State and Trait Anxiety were significantly associated with compliant behavior ($r=.544$ and $r=.682$, respectively.

c) A low correlation ($r=.062$) was found between depression and compliance.

d) Although correlations between compliance and other variables fell outside a strict range of statistical confidence, age and patients' being married had the highest association with compliance.

The significance of these findings is discussed in the preceding section.

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APPENDIX:

The Psychological Questionnaire

OUTPATIENT QUESTIONNAIRE

Date of Birth_____ Religious Preference_____

Education_____ Occupation_____

Number of people now living with you_____

Spouse or friend of the opposite sex_____

Friend of the same sex_____

Parents alive_____ Children_____

Name of your doctor here_____

1. What is the medical condition for which you are being treated?
2. Is kidney failure life-threatening?
3. What is hemodialysis?
4. Why do you need hemodialysis?
5. For how long (months, years) will you have to remain in the hemodialysis program?
6. For how many hours do you have to be dialyzed?
7. Are there any precautions or restrictions concerning what you eat or drink on dialysis?
8. Why are the precautions necessary?

ZUNG DEPRESSION SCALE

Here are some statements about how you might feel. Letter each statement (A= a little of the time, B= some of the time, C= a good part of the time, D= most of the time), according to how often you have that way in the last few days.

1. I feel downhearted and blue.
2. Morning is when I feel the best.
3. I have crying spells or feel like it.
4. I have trouble sleeping at night.
5. I eat as much as I used to.
6. I still enjoy sex.
7. I notice that I am losing weight.
8. I have trouble with constipation.
9. My heart beats faster than usual.
10. I get tired for no reason.
11. My mind is as clear as it used to be.
12. I find it easy to do the things I used to.
13. I am restless and can't keep still.
14. I feel hopeful about the future.
15. I am more irritable than usual.
16. I find it easy to make decisions.
17. I feel that I am useful and needed.
18. My life is pretty full.
19. I feel that others would be better off if I were dead.
20. I still enjoy the things I used to do.

BECK DEPRESSION INVENTORY

Below are groups of statements. Listen to all the statements in each group and choose the one that best describes the way you feel at this moment.

A. I do not feel sad
I feel blue or sad
I am blue or sad all the time and I can't snap out of it
I am so sad or unhappy that it is quite painful
I am so sad or unhappy that I can't stand it

B. I am not particularly pessimistic or discouraged about the future
I feel discouraged about the future
I feel I have nothing to look forward to
I feel that I won't ever get over my troubles
I feel that the future is hopeless and that things cannot improve

C. I do not feel like a failure
I feel I have failed more than the average person
I feel I have accomplished very little that is worthwhile or that means anything.
As I look back on my life all I can see is a lot of failures
I feel I am a complete failure as a person (parent, husband, wife)

D. I am not particularly dissatisfied
I feel bored most of the time
I don't enjoy things the way I used to
I don't get satisfaction out of anything anymore
I am dissatisfied with everything

E. I don't feel particularly guilty
I feel bad or unworthy a good part of the time
I feel quite guilty
I feel bad or unworthy practically all the time now
I feel as though I am very bad or worthless

F. I don't feel I am being punished
I have a feeling that something bad may happen to me
I feel I am being punished or will be punished
I feel I deserve to be punished
I want to be punished

G. I don't feel disappointed in myself
I am disappointed in myself
I don't like myself
I am disgusted with myself
I hate myself

H. I don't feel I am any worse than anybody else
I am critical of myself for my weaknesses or mistakes
I blame myself for my faults
I blame myself for everything bad that happens

I. I don't have any thoughts of harming myself
I have thoughts of harming myself but I wouldn't carry them out
I feel I would be better off dead
I feel my family would be better off if I were dead
I have definite plans about committing suicide
I would kill myself if I could

J. I don't cry any more than usual
I cry more now than I used to
I cry all the time now- I can't stop it
I don't get irritated at all the things that used to irritate me

K. I am no more irritated now than I ever am
I get annoyed or irritated more easily than I used to
I feel irritated all the time
I don't get irritated at all at the things that used to irritate me

L. I have not lost interest in other people
I am less interested in other people now than I used to be
I have lost most of my interest in other people and have little feeling for them
I have lost all my interest in other people and don't care about them at all

M. I make decisions about as well as ever
I try to put off making decisions
I have great difficulty in making decisions
I can't make any decisions at all any more

N. I don't feel I look any worse than I used to
I am worried that I look old or unattractive
I feel that there are permanent changes in my appearance that make me look unattractive
I feel that I am ugly or repulsive looking

O. I can work about as well as before
It takes extra effort to get started at doing something
I don't work as well as I used to
I have to push myself very hard to do anything
I can't do any work at all

P. I can sleep as well as usual
I wake up more tired in the morning than I used to
I wake up 1-2 hours earlier than usual and find it hard to get back to sleep
I wake up early every day and can't get more than 5 hours sleep

Q. I don't get any more tired than usual
I get tired more easily than I used to
I get tired from doing anything
I get too tired to do anything

R. I am no more concerned about my health than usual
I am concerned about aches and pains or upset stomach or constipation
I am so concerned with how I feel or what I feel that it's hard to think of much else
I am completely absorbed in what I feel

S. I have not noticed any recent change in my interest in sex
I am less interested in sex than I used to be
I am much less interested in sex now
I have lost interest in sex completely

STATE-TRAIT ANXIETY INVENTORY

Here are some statements which people have used to describe themselves. Number each statement (1= not at all, 2= somewhat, 3= moderately so, 4= very much so) to indicate how strongly you feel that way at this moment.

1. I feel calm
2. I feel secure
3. I am tense
4. I am regretful
5. I feel at ease
6. I feel upset
7. I am worrying over possible misfortunes
8. I feel rested
9. I feel anxious
10. I feel comfortable
11. I feel self-confident
12. I feel nervous
13. I feel jittery
14. I feel high strung
15. I am relaxed
16. I feel content
17. I am worried
18. I feel overexcited and rattled
19. I feel joyful
20. I feel pleasant

Now number these statements to indicate how strongly you feel this way in general.

21. I feel pleasant
22. I tire quickly
23. I feel like crying
24. I wish I could be as happy as others seem to be
25. I am losing out on things because I can't make up my mind soon enough
26. I feel rested
27. I am calm, cool and collected
28. I feel that difficulties are piling up so that I cannot overcome them.

STAI, continued.

29. I worry too much over something that really doesn't matter
30. I am happy
31. I am inclined to take things hard
32. I lack self-confidence
33. I feel secure
34. I try to avoid facing a crisis or difficulty
35. I feel blue
36. I am content
37. Some unimportant thought runs through my mind and bothers me
38. I take disappointments so keenly that I can't put them out of my mind
39. I am a steady person
40. I become tense and upset when I think about my present concerns

SOCIAL REACTION INVENTORY

For each of the following pair of statements, select the statement which you more strongly feel to be true.

1. Children get into trouble because their parents punish them too much.
   The trouble with most children nowadays is that their parents are too easy with them.
2. Many of the unhappy things in people's lives are partly due to bad luck.
   People's misfortunes result from the mistakes they make.
3. One of the major reasons why we have wars is because people don't take enough interest in politics.
   There will always be wars, no matter how hard people try to prevent them.
4. In the long run, people get the respect they deserve in this world.
   Unfortunately, an individual's worth often passes unrecognized, no matter how hard he tries.
5. The idea that teachers are unfair to students is nonsense.
   Most students don't realize the extent to which their grades are influenced by accidental happenings.
6. Without the right breaks, one cannot be an effective leader.
   Capable people who fail to become leaders have not taken advantage of their opportunities.
7. No matter how hard you try, some people just don't like you.
   People who can't get others to like them, don't understand how to get along with others.
8. Heredity plays the major role in determining one's personality.
   It's one's experiences in life which determine what they're like.
9. I have often found that what is going to happen, will happen.
   Trusting to fate has never turned out as well for me as making a decision to take a definite course of action.
10. In the case of the well-prepared student, there is rarely, if ever, such a thing as an unfair test.
    Many times exam questions tend to be so unrelated to coursework, that studying is really useless.
11. Becoming a success is a matter of hard work, luck has little or nothing to do with it.
    Getting a good job depends mainly on being in the right place at the right time.

12. The average citizen can have an influence in government decisions.
    This world is run by the few people in power, and there is not much the little guy can do about it.
13. When I make plans, I am almost certain that I can make them work.
    It is not always wise to plan too far ahead, because many things turn out to be a matter of good or bad fortune anyhow.
14. There are certain people who are just no good.
    There is some good in everybody.
15. In my case, getting what I want has little or nothing to with luck.
    Many times, we might just as well decide what to do by flipping a coin.
16. Who gets to be the boss often depends on who was lucky enough to be in the right place first.
    Getting people to do the right thing depends on ability, luck has little or nothing to do with it.
17. As far as world affairs are concerned, most of us are the victims of forces we can neither understand, nor control.
    By taking an active part in political and social affairs, the people can control world events.
18. Most people don't realize the extent to which their lives are controlled by accidental happenings.
    There really is no such thing as "luck."
19. One should always be willing to admit his mistakes.
    It is usually best to cover up one's mistakes.
20. It is hard to know whether or not a person really likes you.
    How many friends you have depends upon how nice a person you are.
21. In the long run, the bad things that happen to us are balanced by the good ones.
    Most misfortunes are the result of lack of ability, ignorance, laziness, or all three.
22. With enough effort, we can wipe out political corruption.
    It is difficult for people to have much control over the things politicians do in office.
23. Sometimes I can't understand how teachers arrive at the grades they give.
    There is a direct connection between how hard I study and the grades I get.

24. A good leader expects people to decide for themselves what they should do.
    A good leader makes it clear to everybody what their jobs are.
25. Many times I feel that I have little influence over the things that happen to me.
    It is impossible for me to believe that chance or luck plays an important role in my life.
26. People are lonely because they don't try to be friendly.
    There's not much use in trying too hard to please people, if they like you, they like you.
27. There is too much emphasis on athletics in high school.
    Team sports are an excellent way to build character.
28. What happens to me is my own doing.
    Sometimes I feel that I don't have enough control over the direction my life is taking.
29. Most of the time, I can't understand why politicians behave the way they do.
    In the long run, the people are responsible for bad government, on a national as well as on a local, level.

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